CLAIMS

What is claimed is.

1. A method of fabricating a thermal interface structure, the method comprising:

preparing a composite slurry of carbon nanotubes in a liquid polymer;

aligning the nanotubes in the composite by applying an electrostatic field; and

curing the composite while continuing to apply the electrostatic field.

2. The method of claim 1 also comprising forming the composite into a thermal interface structure.

3. The method of claim 1 wherein aligning the nanotubes in the slurry comprises:

dispensing the slurry onto a surface of a continuous conveyor as a layer of unaligned carbon nanotube composite; and

applying an electrostatic field to the layer of unaligned carbon nanotube composite to form an aligned carbon nanotube composite with the carbon nanotubes substantially perpendicular to the surface of the conveyor.

4. The method of claim 3 wherein aligning the carbon nanotubes and curing the polymer are carried out while the continuous conveyor is moving the composite.

5. The method of claim 1 wherein the aligning of the carbon nanotubes in the composite is performed by applying an electrostatic field to the composite.

6. The method of claim 5 wherein applying an electrostatic field to the composite is performed by immersing at least a portion of a parallel plate capacitor in the composite.

7. The method of claim 6 wherein the applying the electrostatic field to the slurry between the plates of the capacitor continues during at least a portion of the time during which curing of the polymer occurs.

8. The method of claim 5 wherein applying an electrostatic field to the composite is performed by placing at least a portion of the composite between plates of a parallel capacitor which are not in contact with the composite.

9. The method of claim 1 wherein curing of the composite is carried out, at least in part, during the aligning of the nanotubes in the composite.

10. The method of claim 6 also comprising forming the composite into a billet.

11. The method of claim 10 wherein the length and width dimensions of the capacitor plates are larger than the length and width dimensions of the thermal interface structure.

12. The method of claim 1 wherein aligning the carbon nanotubes in the composite comprises:

inserting at least one parallel plate capacitor in a bath containing the composite slurry;

adjusting the spacing of plates of the capacitor until the distance between them is substantially equal to the desired thickness of the thermal interface material billet;

applying an electrostatic field to the slurry between the plates; and

removing the capacitor from the bath.

13. The method of claim 12 wherein applying an electrostatic field to the slurry between the plates comprises applying a voltage between the plates of the capacitor.

14. The method of claim 12 wherein curing the composite is commenced while the electrostatic field is being applied.

15. The method of claim 5 wherein applying an electrostatic field comprises

inserting at least one parallel plate capacitor in a bath containing the composite slurry;

adjusting the spacing of plates of the moving the plates of capacitor until the distance between them is substantially equal to the desired thickness of the thermal intermediate;

connecting the plates of the capacitor to a voltage source

applying an electrostatic field to the slurry between the plates; and

removing the capacitor from the bath;

16. A method of fabricating a thermal interface material, the method comprising:

preparing a slurry of carbon nanotubes in a liquid polymer;

dispensing the slurry onto a surface of a conveyor as a layer of unaligned carbon nanotube composite;

applying an electrostatic field to the layer of unaligned carbon nanotube composite to form an aligned carbon nanotube composite with the carbon nanotubes substantially perpendicular to the conveyor; and

curing the aligned carbon nanotube composite.

17. The method of claim 16 further comprising subdividing the aligned carbon nanotube composite into individual billets.

18. The method of claim 16 wherein applying the electrostatic field to the layer of unaligned carbon nanotube composite is performed by placing opposing plates of a capacitor adjacent opposing sides of the surface of the conveyor bearing the slurry.

19. Apparatus for forming a thermal interface structure, comprising:

a vat to store a slurry of carbon nanotubes in a liquid interstitial material;

at least one parallel plate capacitor movable into and out of the slurry to receive a portion of the slurry between the plates, the capacitor being adjustable to vary the distance between the plates while immersed in the slurry; and

a voltage source to apply an electric field between the plates of the capacitor to align a majority of the nanotubes in the portion of the slurry between the plates to an orientation substantially perpendicular to the plates of the capacitor.

20. The apparatus of claim 19 also comprising curing means to commence curing of the portion of the slurry between the plates after aligning the nanotubes in the portion of the slurry.

21. The apparatus of claim 20 wherein the curing commences after removal of the capacitor from the vat of slurry.

22. Apparatus for forming a thermal interface structure comprising:

a hopper to store a slurry of carbon nanotubes in a liquid polymeric interstitial material;

a conveyor positioned to transport slurry from the hopper to a further workstation;

electrical field applying apparatus positioned to apply an electrical field to align carbon nanotubes in the slurry to a preferred orientation without removal of the slurry from the conveyor at the further work station; and

curing apparatus positioned to commence curing of the aligned slurry.

23. The apparatus of claim 22 wherein the curing apparatus comprises a lamp to apply ultraviolet illumination to the aligned slurry.

24. The apparatus of claim 22 wherein the curing apparatus comprises a sprayer to apply a curing chemical spray to the aligned slurry.